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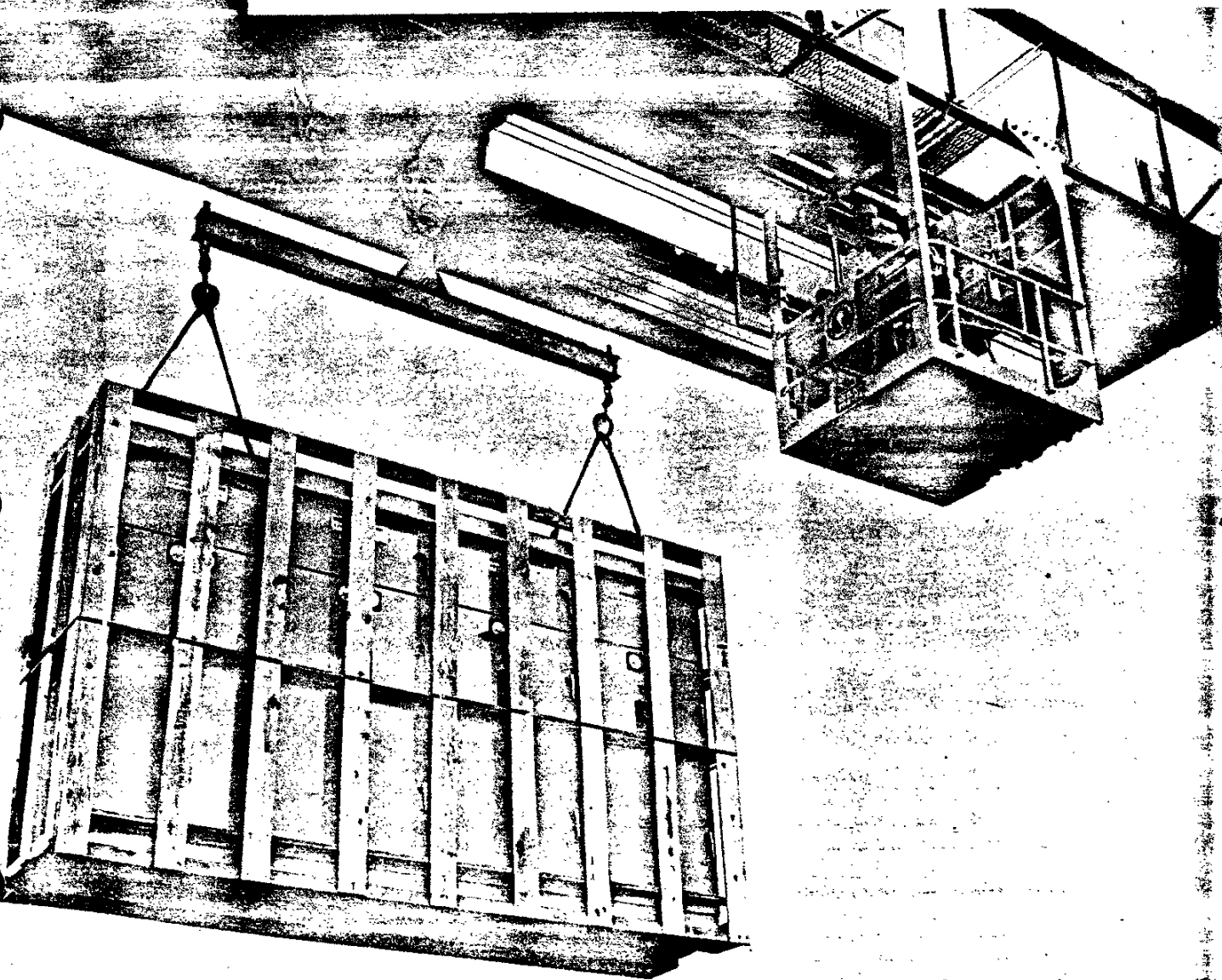
INSTALLATION INSTRUCTIONS

IC7160 LIMITAMP* CONTROLLERS

WITH AIR-BREAK CONTACTOR
AND 30-INCH-DEEP PANEL

2300, 4000, and 4600 Volts, A-c (Utilization Voltage)

2400, 4160, and 4800 Volts, A-c (Distribution Voltage)



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GENERAL  ELECTRIC

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These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

INSTALLATION OF IC7160 LIMITAMP CONTROLLERS

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INTRODUCTION

This publication is prepared as a guide to handling and making electrical connections to Limitamp control panels. For application and maintenance information, refer to instruction book GEH-1938.

RECEIVING

Limitamp control equipment is installed in a rigid, floor-mounted enclosure which has a front and rear floor sill and a lifting beam. The panels are crated and shipped in an upright position and, when received, should be kept upright, unless high-voltage contactors are removed and other contactors blocked closed.

The power fuses, high-voltage contactor arc chutes and motor field resistors are boxed or shipped separately. Components are identified by the catalog number of the panel for which they are intended. Care should be exercised in unpacking the equipment to make certain that no small parts are thrown away with the packing material.

A Limitamp lineup of three or more panels, as crated for domestic shipment, is shown in Fig. 1. One or two Limitamp controllers are normally crated in corrugated cardboard as shown in Fig. 2. After the panel is received, the crating may be removed and the panel, as shown in Fig. 3, handled on the shipping skids.

HANDLING

It is always preferable to handle any Limitamp controller by its lifting beam. Figure 4 shows the recommended method of lifting a single panel while Fig. 5 shows the recommended method of lifting a lineup.

Note that the lineup in Fig. 5 is suspended from an equalizing bar. A lineup should be supported at as many points as possible. If there is not enough headroom to lift the panel by its lifting beam, then track jacks, as shown in Fig. 6 and 7, may be used.

Figure 6 shows how a Limitamp lineup may be raised by placing a track jack under the shipping skid, and how rollers can then be placed under the skid for rolling the equipment to its final location. The panel should then be raised by its lifting beam, the shipping skid removed, and the panel set into place.

On a single panel, track jacks may be used either under the ends of the floor sills or on angles bolted to both sides of the enclosure. The panel may then be jacked or blocked up by these angles (see Fig. 7). Paper placed between the angle and the side of the enclosure will help prevent damage to the enclosure finish.

The use of fork-lift trucks is not recommended since the forks may damage the enclosure or interior parts of the equipment. If no other method of handling is available, the forks must go under the floor sills to avoid damaging the equipment.

ACCESSIBILITY TO PANEL INTERIOR

During and after the handling operation it will be necessary to open panel doors. While the doors to low-voltage control compartments are readily accessible and not mechanically interlocked, the doors to compartments containing high-voltage components connected to the load side of the panel isolating switch are mechanically interlocked with the operating mechanism of the isolating switch. A control-power interlock for removing load from the isolating switch is also mechanically interlocked with the isolating switch and must be operated before the switch can be operated. The control-power interlock is located on the right-hand sidewall of the center (control) compartment (see Fig. 8). A special nameplate on the door of the isolating switch compartment (see Fig. 9) provides instructions for opening the isolating switch and doors.

The procedure to follow for operating the control-power interlock and door interlocking system is as follows:

1. To open the isolating switch and all compartment doors:

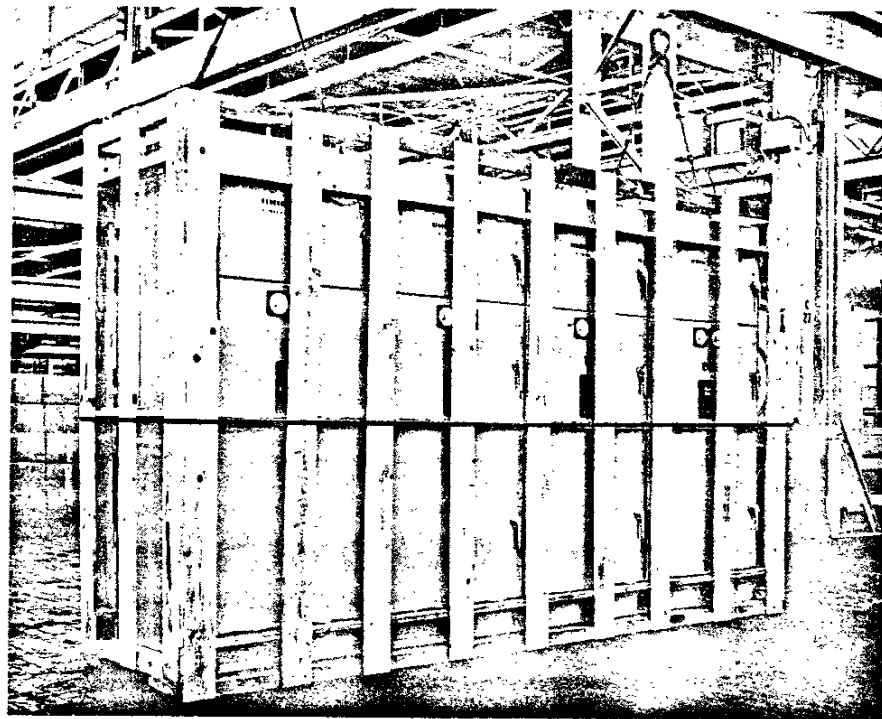


Fig. 1. Limitamp lineup crated for domestic shipment

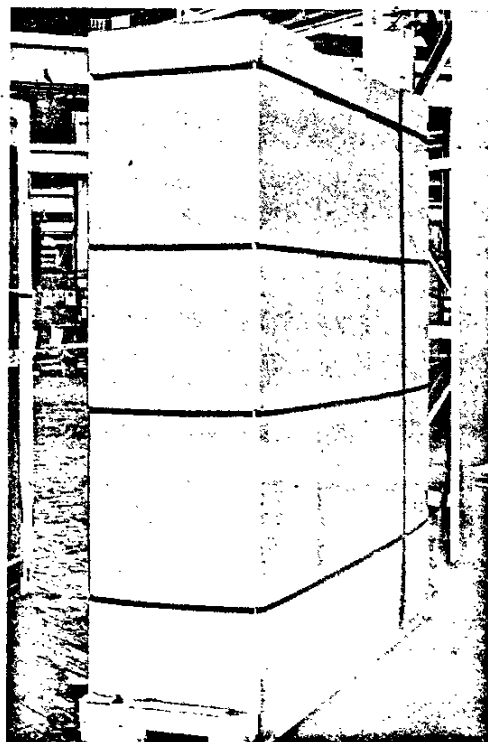


Fig. 2. Limitamp controller crated in corrugated cardboard

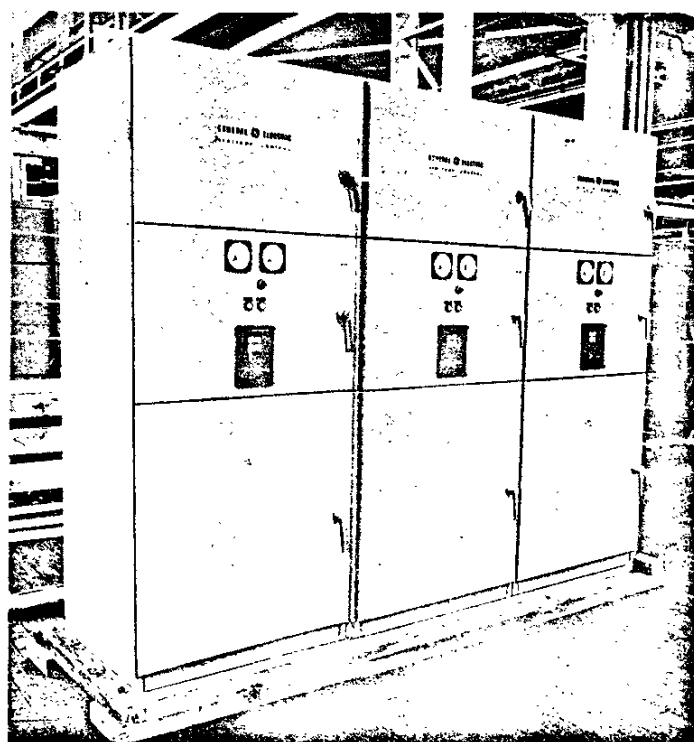


Fig. 3. Limitamp lineup mounted on shipping skids

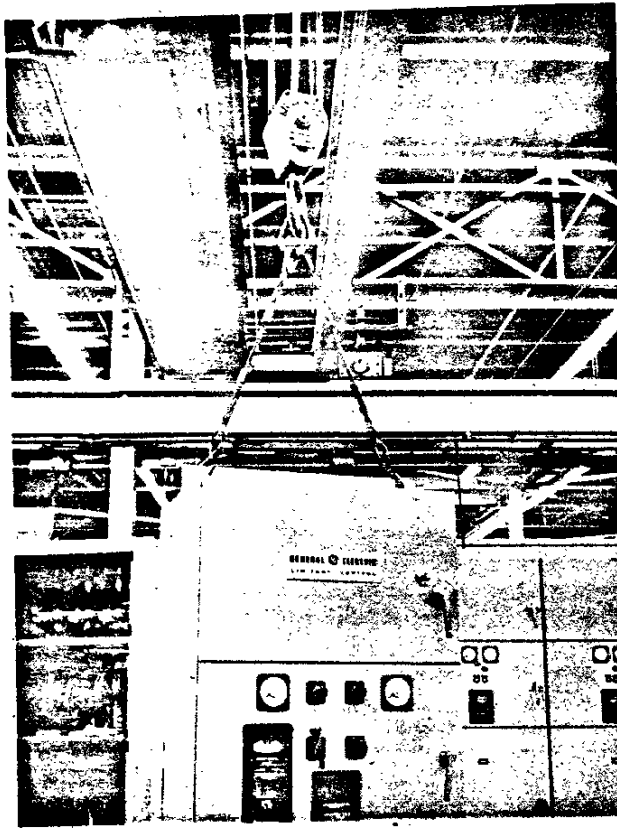


Fig. 4. Recommended method of lifting a single panel

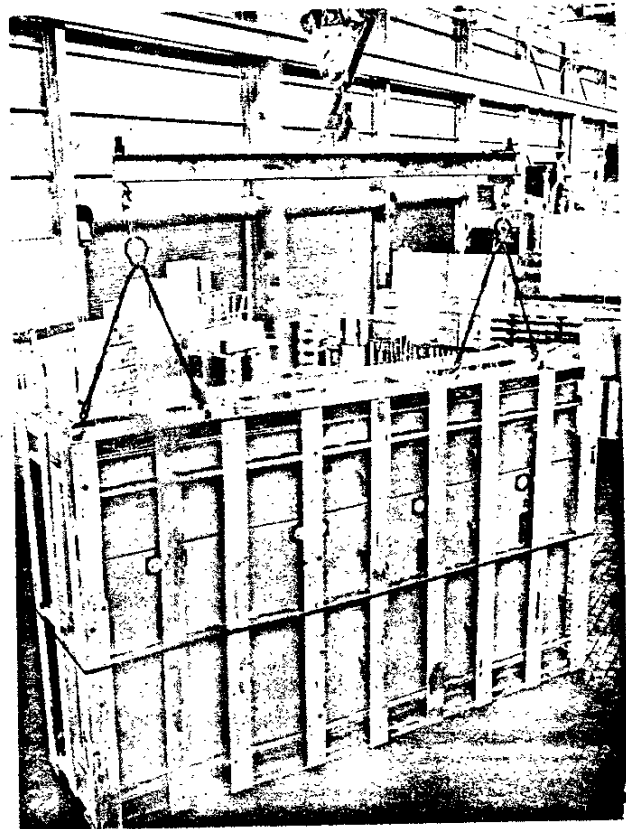


Fig. 5. Recommended method of lifting a Limitamp lineup. Note that the lineup is suspended from an equalizing bar



Fig. 6. Shipping skid raised by track jack allows room for rollers under the skid

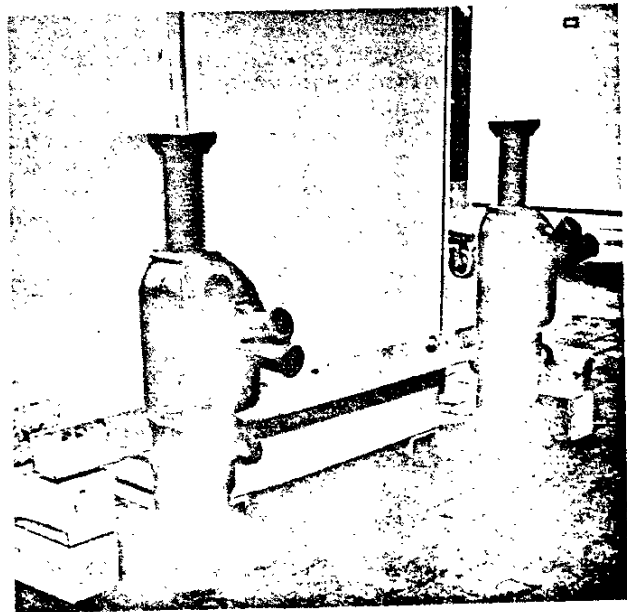


Fig. 7. A single panel may be jacked or blocked up by attaching angles to the sides of the enclosure

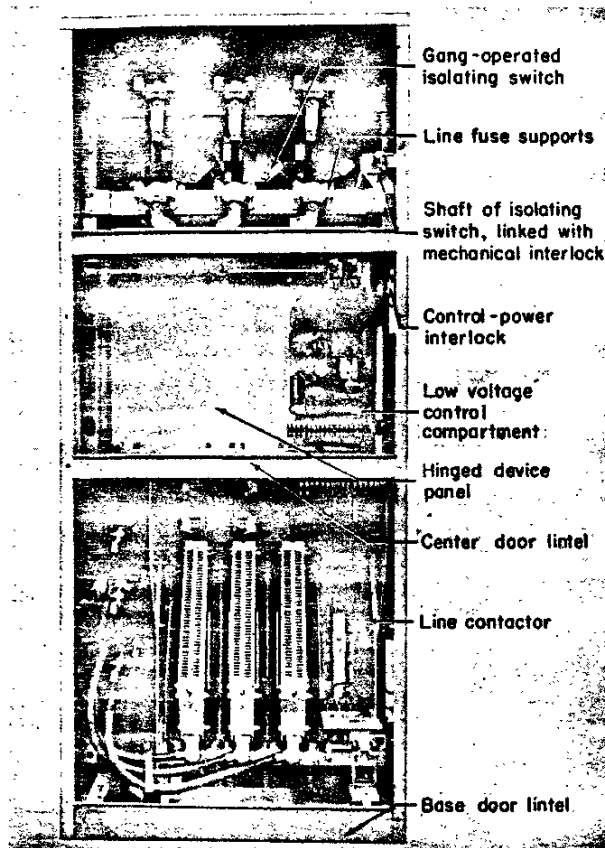


Fig. 8. View of Limitamp controller showing location of principal components

a. Open all contactors connected to load side of this switch by operating the stop button or other control device provided for this purpose.

b. Open the center door and move the operating handle of the control-power interlock (inside center compartment on right sidewall) to the "Open" position.

c. Shut the center compartment door.

d. Turn the switch handle to the "Switch Open" position and operate the thumb-latch.

e. High-voltage compartment doors mechanically interlocked with this switch are now unlocked.

2. To close the isolating switch and energize the starter:

a. Shut all doors. (A "Door-Forgetter" mechanism necessitates that all doors to compartments having high-voltage components connected to the load side of the switch be closed before the isolating switch is closed.)

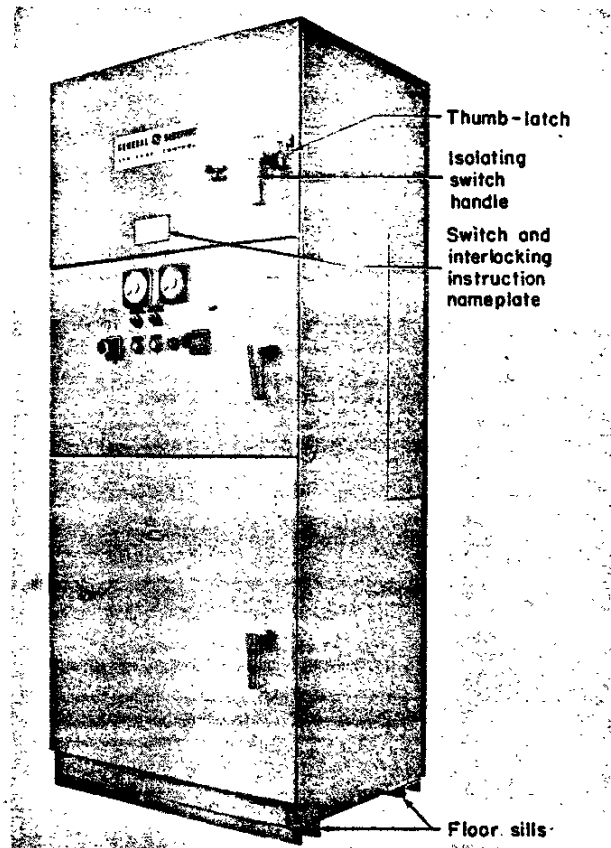


Fig. 9. View showing full-voltage Limitamp controller

b. Operate the thumb-latch and turn the switch handle to the "Switch Closed" position.

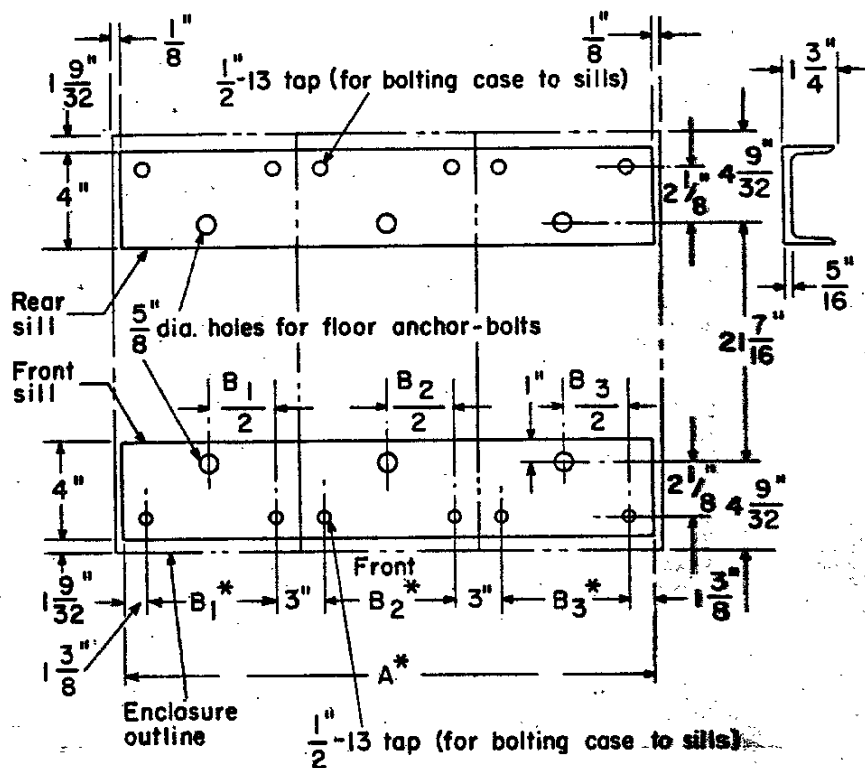
c. Open the center door and move the operating handle on the control-power interlock to the "Closed" position.

d. Shut the center door.

e. Operate the starter in the normal manner.

The thumb-latch (Fig. 9) holds the door of the isolating switch compartment closed after the switch handle has been thrown to the open position. This thumb-latch must be in the closed position before the isolating switch can be closed.

Key locks are furnished only for doors to high-voltage compartments in which components are connected to the line side of the isolating switch and thus not isolated when the switch is open. ONLY COMPETENT PERSONNEL SHOULD BE AUTHORIZED TO OPERATE SUCH LOCKS. Key locks may be furnished for all panel doors if so desired. The keys for these locks are tied to the controller.



Key *	
Letter	Definition
A	Length of lineup-minus 1/4 "
B ₁ , B ₂ B ₃	Outside width of case-minus 3"

Fig. 10. Floor sills used on Limitamp equipment

Kirk locks are often ordered for interlocking with various components such as other switches, feeder breaker, etc. These locks must be operated either before the doors of their respective compartments can be opened or before additional functional sequences can be performed. The keys are tied to the locks and identified by the lock serial number. Refer to diagrams (furnished with the equipment) for the locking sequence.

INSTALLING FLOOR SILLS

It is essential that the panel be securely fastened in a true upright position on a level surface to permit proper operation of the devices mounted on the panel. This means that the foundation for the floor sills should be carefully prepared.

The floor sills, front and rear, used for Limitamp equipment are shown in Fig. 10.

There are several possible methods of installing the floor sills; the most frequently used are described below. (The first two methods are recommended because they call for grouting the floor sills. This will leave the roll-out contactor tracks at floor level and no special inclined plane will be required for removing the contactor from the panel.)

It is recommended that on all installations 1/2-inch mounting bolts be grouted into the floor in the proper location for fastening the panel, and then that one of the following methods be used for installing the floor sills.

1. If the concrete is to be poured before the panel is installed, a dummy set of floor sills of the proper size and length can be used. The dummy sills can be made of wood and should be set in place, together with the 1/2-inch anchor bolts, before the concrete is poured. They may then be replaced with the actual sills after the panel is received.

If desired, 1 3/4- x 4-inch channels may be grouted into the floor in place of the dummy sills. The floor sills on the panel may then be removed when the equipment is received, and the panel bolted directly to the grouted-in channel. See Fig. 10 for floor sill layouts.

Care should be exercised when handling several panels in a lineup after the floor sills have been removed since the panels may then sag and distort the structural members.

2. If the concrete is to be poured at the time the panel is installed, grout the 1/2-inch anchor bolts into the sub-floor and slip the panel over them. Then pour concrete around the floor sills. This should be done carefully so as not to splash concrete on the panel devices. Care also should be taken to finish the surface to obtain a tight joint between the floor and the enclosure side which will prevent entrance of dirt at the bottom of the panel.

3. If the panel is to be installed on an existing floor, grout the 1/2-inch anchor bolts in the floor and slip the panel over them. When the panel is installed in this manner, there will be a 1 3/4-inch gap between the floor and the sides of the panel enclosure. This gap should be closed to prevent accumulation of dirt under the panel which eventually may interfere with proper operation of the panel devices.

4. On single-case installations (except on outdoor enclosures) the floor sills may be removed and the enclosing case bolted to the floor if the floor surface is level.

When floor sills are grouted, care should be taken that the bolt-holes used to fasten the panels to the floor sills are not filled with cement and that room is left to run the bolt through the sill. This may be done by putting bolts through these holes and then covering the threads with grease. The grout will not stick to the bolt and, when the grout hardens, the bolt may be removed.

Also, if it is desired, grout holes 1 1/2 to 2 inches in diameter may be drilled near the anchor bolt holes. These will provide room to pour grout and force it, with a wire, under the whole length of the sills.

LEVELING THE PANEL

In all of the above cases, check the level position of the sills with a machinists level and check to see that the surfaces of the front and back sills are in a level plane. This will insure that the panel will be in a true upright position on a level surface. The following are suggested procedures for leveling floor sills and panels:

1. On single panel installations, four anchor bolts may be set for the anchor bolt holes on each corner of the panel. A nut should be run down on each anchor bolt and then the panel slipped over these anchor bolts. By using a hand wrench on the nuts, each corner may then be adjusted to level the panel.

2. On any Limitamp installation, anchor bolts may be grouted in the floor and nuts then run down on each anchor bolt. Then, by using a transit, set these nuts at a point 5/16 inch (the thickness of the web on the floor sills) below the desired position for the bottom of the enclosure. The panel may then be slipped over the anchor bolts and it should be level. However, if any further adjustments are required the equipment may be raised slightly and the appropriate nut run up or down. After the panel is finally in position, a second nut should be run down over the top of the anchor bolt to lock the panel into position. The floor sills can then be grouted.

WIRE AND CABLE ENTRANCE

Provisions should be made, before the panel is in place, for incoming and outgoing power cable and control wires. In all cases, the outline diagram for the panel should be used to determine the size and location of the space available, and the panel wiring diagram should be checked for the number of wires and cables to be installed. Space is provided for either top or bottom entrance of incoming conduit. Holes for conduit entrance at the top should be drilled as required. A wire trough is provided for field and control wiring as shown in Fig. 11. Figure 11 shows both control and power cable entrances.



Fig. 11. Connection of incoming power leads to bus

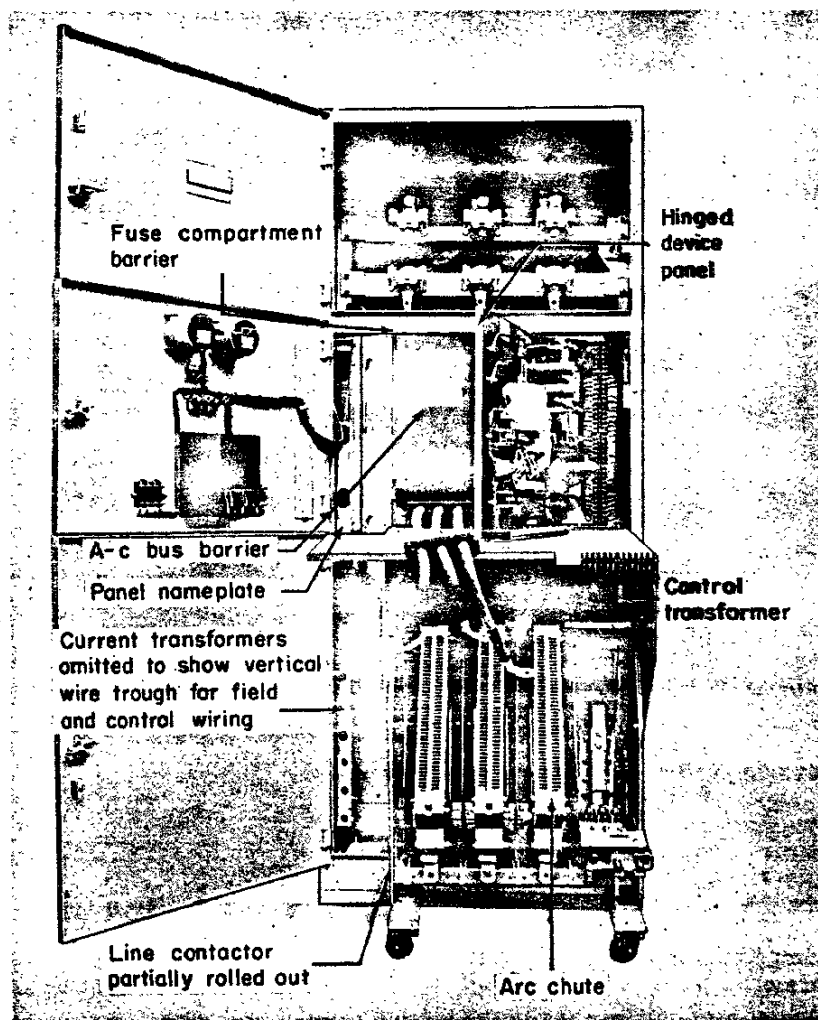


Fig. 12. Free entrance to controller gained by rolling out IC2812 contactor

On outdoor enclosures, it is recommended that all cables enter from the bottom of the panel. If cable must enter from the top, the recommended procedure is to drill the necessary holes in the top (according to the outline diagram) and weld in conduit nipples so as to prevent rain water, etc., from entering.

CAUTION: EVERY PANEL SHOULD BE THOROUGHLY GROUNDED.

In panels where it will be necessary to bring in conduit and terminate power and control wiring, it will be necessary to remove the roll-out contactor from the individual controller (see Fig. 12). On complex starters having more than one high-voltage con-

tactor, however, it ~~may~~ not be necessary to remove all such contactors. Refer to the outline and wiring diagram to determine which sections of the lineup will have cable terminations. (Due to the physical arrangement and space available in some sections, it may be possible to terminate cables without removing the contactor.)

When it is desired to feed the power bus with more than one set of cables, it may be found advantageous to bring these sets of cables into more than one panel, thus eliminating bunching of cables in any single panel. Two 500-MCM cables per phase is the maximum recommended for connecting to the a-c power bus in a single starter panel. Further information

is contained in these instructions under the "Power Cable Termination" section.

CAUTION: Power should not be applied to the panel until the following steps have been completed and the panel readied for operation. Since the back covers on many Limitamp controllers are used to support miscellaneous high-voltage components, this cover should not be removed at any time unless otherwise indicated on the outline diagram.

REMOVAL OF CONTACTOR

If it is not necessary to remove the contactor, steps 1-7, 12, 13, 15 and 16 of the following procedure may be omitted.

1. Remove the door lintel which separates the center (low voltage) compartment from the roll-out contactor compartment by loosening the two nuts and sliding it out. To remove the base door lintel, remove the five screws on the front and the two screws on the roll-out contactor assembly.

2. Release the roll-out contactor assembly as follows:

a. Remove all shipping blocks and packing material.

b. Disconnect the wires on the panel side of the terminal board at the top right hand side of the roll-out contactor assembly.

c. Unbolt the cables connected to the front side of the current transformers.

d. Unbolt the cables from the bottom fuse supports.

3. Disconnect any field power and/or control wiring connected to the left hand side of the hinged control panel. This panel may be swung out after removing the two nuts on the left hand side of this panel.

4. The cables which were disconnected from the bottom of the fuse support may now be dropped over the top of the roll-out contactor assembly and the contactor rolled out.

NOTE: If the starter contains more than one contactor with cross-cabling it may be necessary to disconnect and remove the cables which interconnect these two contactors. If flexible steel cables are provided for mechanical interlocking between contactors, remove the cable from its terminator on the contactor and bend it to one side to permit

the removal of the contactor. Do not disconnect the complete mechanical interlocking mechanism on the contactor. If the floor sills have not been grouted, a wooden inclined plane 1 3/4 inches high by six or more inches wide and 3 feet long will be required to lower the contactor to floor level.

5. Remove the steel bus barrier by removing the retaining hardware.

6. Remove the metal barrier beneath the switch compartment by removing the two nuts on each side. This will allow standing room for the operator to pull in cable.

7. After pulling in the power cable from either the top or the bottom of the enclosure, the incoming line should be connected either to the bus or the incoming power terminals stamped L1, L2, L3, as required. Do not energize the incoming lines at this time.

8. Next, the motor leads should be connected to the side of the current transformer marked T1, T2, T3. (Refer to the wiring diagram.) On special panels, the motor leads may be connected other than described above. The outline and wiring diagram will indicate the proper connection.

9. Pull the control wires through the vertical wire trough which has been provided for running the low-voltage control wires from the conduit to the terminal board, and connect them to the terminal board. Also mount and connect wires to discharge resistors, fixed-tap resistors, and other components which may have been shipped separately. These are tagged for use with specific panels and care should be taken to mount them on the panels for which they are tagged.

10. Inspect the incoming power and motor leads to see that they have proper clearance between live parts and ground. Also see that the cables have not been so grouped that a conductive dust can accumulate on their surface and cause a short circuit between uninsulated connections and/or to ground. If the connections are satisfactory, replace the bus barrier.

11. Examine the roll-out contactor assembly as outlined below. (Refer to instruction book GEH-1937 for more complete information.)

a. Carefully inspect all parts of the contactor to insure that the shipping supports, blocks, or ties have been removed and that the contactor has not been damaged in shipment.

b. Remove any grease or oil from the magnet face.

c. Make sure that all parts of the contactor are cleaned and that there is no dirt or grease on the contact or interlock tips.

d. Contactors which have been removed should be rolled back into the controller. Install arc chutes on all contactors. (See that the chutes are inserted in the position indicated by the decals on the chutes.)

CAUTION: Arc chutes must be in place before power is applied to the contactor. The chutes are essential to confine and extinguish the arcs. Without the chutes the arcs may do serious damage.

12. Replace the base door lintel (Fig. 8). This must be kept properly in place to secure the contactor and complete the enclosure.

13. With the contactor in place, reconnect the cables to the lower terminals of the power fuses. See that the cable clamps hold the cables away from the surrounding metal surfaces.

14. Connect the three lower cables on the contactor to the front terminals of the current transformers. Replace any cross-cabling which was removed between contactors in the same starter. Inspect the cable carefully to see that there is proper clearance between live parts and ground. Replace any mechanical interlocking cables which were removed when the contactor was removed from the panel.

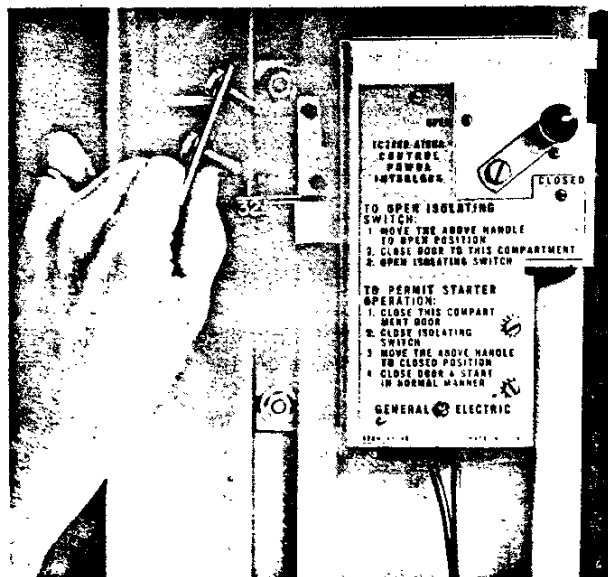


Fig. 13. Control-power interlock adjustment

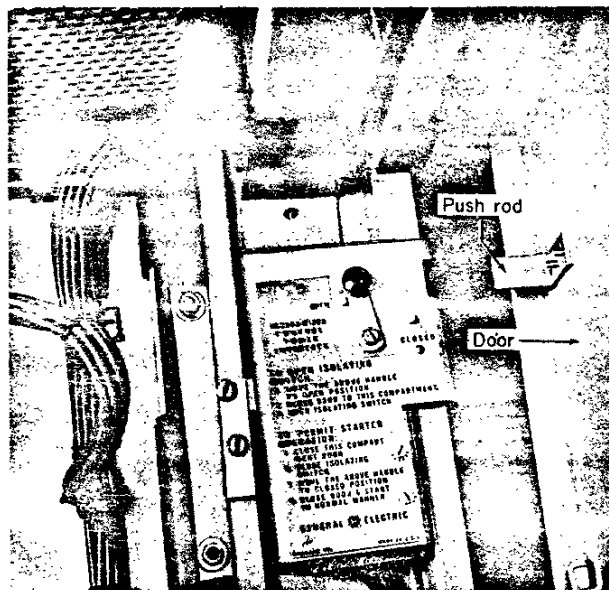


Fig. 14. Control-power interlock and push rod on door

Be careful not to create binding in this cable by kinking it or tightening parts in such a manner as to restrict freedom of movement. (Refer to instruction book GEI-42593 for more complete information.)

15. Swing the hinged base of the low-voltage compartment back into place and fasten. Connect all field and control wires.

16. Reconnect the control wires from the hinged base to the roll-out contactor assembly terminal board.

17. It is very important that the isolating switch, control-power interlock switch, and the mechanical door interlock function properly. These have been carefully checked at the factory, but should be re-examined to make certain that no damage has occurred during shipment and installation. To check the proper alignment of the interlocking mechanism, follow the procedure listed below:

a. Open all the doors.

b. Slowly close the control compartment door and watch the mating of the switch push rod on the door with the cutout on the front of the control-power interlock. See Fig. 13 and 14. When these do not align properly, it is usually an indication that the panel needs leveling. If some adjustment is still required, the push rod may be adjusted up or down.

c. With the control-power interlock switch in the "Open" position, close the control compartment door.

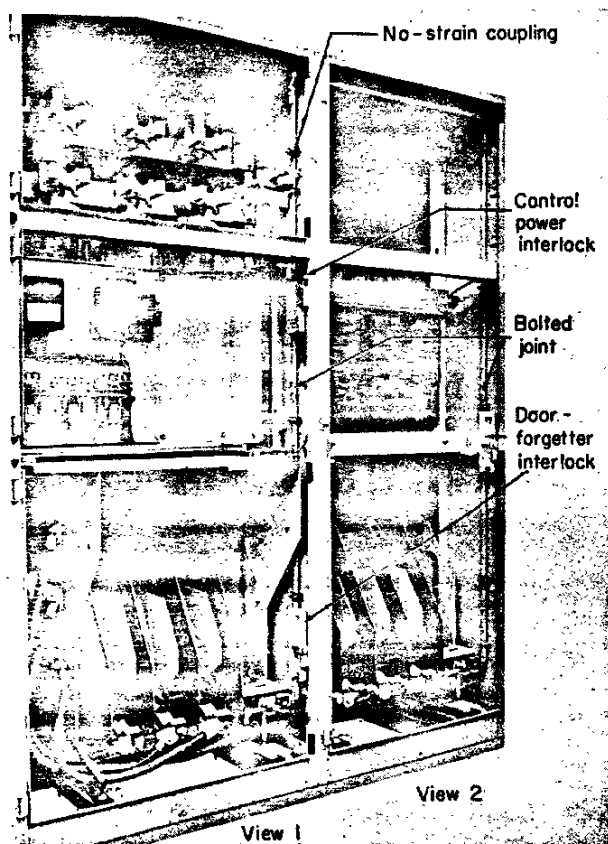


Fig. 15. View 1 shows mechanical door interlock as used on basic panels containing isolating switches. View 2 shows additional interlocking arrangement used when panel has one or more sections of high-voltage components connected to the load side of the isolating switch

d. Close the top door. It should not be possible to close the isolating switch due to a "Door-Forgetter" interlock on the doors to compartments which mount high-voltage components connected to the load side of the isolating switch. (See Fig. 15 and 16.) Push in this interlock by hand and throw the isolating switch to the "Switch Closed" position. It should close completely with a small amount of force, indicating that the vertical link is not binding in the guides along the enclosure wall. Next, reopen the control compartment door and close the control-power interlock switch. It should operate freely, indicating that the bolt is engaging in the right position with the vertical link on the panel sidewall.

e. Attempt to open the isolating switch and observe the isolating switch blades by looking up through the control compartment. A flashlight is desirable for this observation. The switch blades should not move more than four or five degrees from the fully closed position. Return the switch to the fully closed position.

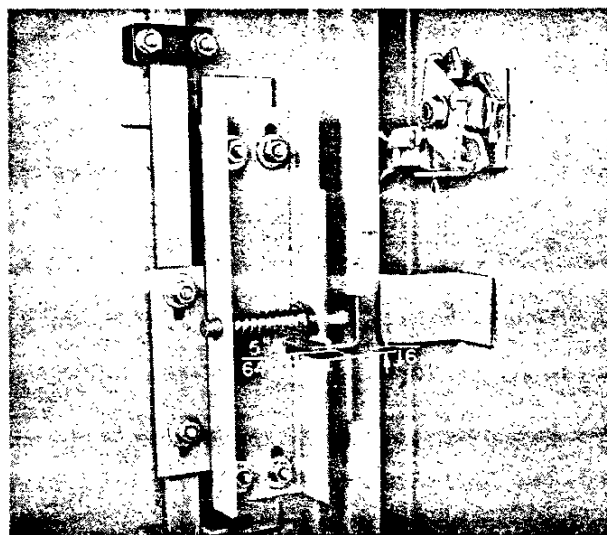


Fig. 16. Close-up view of "door-forgetter" interlock adjustment

f. Hand operate the line contactor to make sure that the contactor's mechanical interlock lever is free to operate without binding with the vertical link on the panel sidewall. The vertical clearance between the contactor lever and the vertical link on

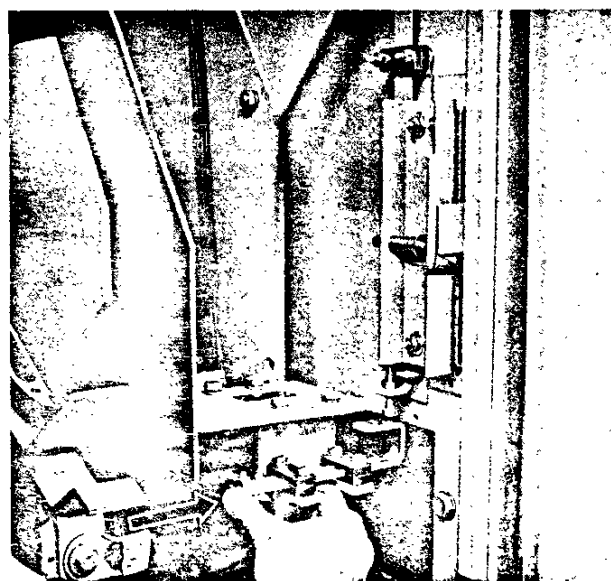


Fig. 17. View shows vertical rod, on right, mechanically connected to gang-operated isolating switch; interference interlock prevents vertical rod from being lowered when the contactor is energized. To check freedom of movement of contactor interlock, move horizontal arm to right with one finger at point of arrow. Little force should be required and action should be smooth and positive

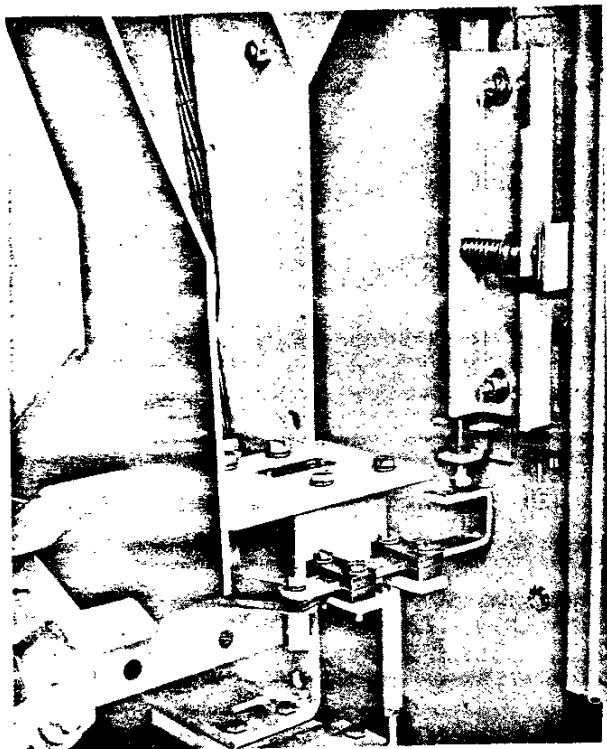


Fig. 18. Contactor mechanical interlock adjustment

the panel sidewall should be 1/16 inch. See Fig. 17 and 18.

g. Block the line contactor in the closed position, open the control-power interlock and close the center door. Again try to open the isolating switch. The blades should not move more than four or five degrees.

h. Unblock the contactor, throw the isolating switch to the "Switch Open" position, and then open all doors.

18. Replace the perforated fuse compartment barrier. Replace the door lintel between the low-voltage control compartment and the roll-out contactor assembly.

19. Insert Type EJ-2 power fuses in the top compartment after first checking the fuse size and catalog number stamped on the end of the fuse with the fuse size and catalog number given on the nameplate on the inside of the fuse compartment to see that they agree. Install the fuses with the red "Blown Fuse" indicator on the bottom. High-voltage fuse tongs should be used for insertion or pulling of fuses. Also insert the Type EJ-1 control-power transformer fuses in the clips provided on the roll-out contactor assembly. Check to see that all fuses are tightly inserted.

Check the nameplate rating of the load controlled to be sure that it agrees with that given on the Limitamp panel nameplate (see Fig. 12). The starter is designed for use with a specific machine, and should not be used on machines with different characteristics.

Controller components boxed and/or shipped separately include power fuses, field resistors, line contactor arc chutes, and various components arranged for mounting on top of the panel. It is important that these components are not interchanged. Each component is tagged for use with a certain control panel; they are referenced to catalog numbers, and should be carefully checked to assure proper installation.

POWER CABLE TERMINATION

In any installation, the cable should be prepared for termination in accordance with the instructions of the cable manufacturer. However, some general recommendations for proper cable termination in Limitamp equipment are given below.

1. Pull in the cables in accordance with the panel outline diagram and position them for maximum clearance between phases, ground and other cable or wire runs. Refer to Fig. 19 for recommended location of incoming cables in a standard Limitamp controller.

2. Prepare the cable for termination in accordance with the manufacturer's instructions.

3. Bolt the cable terminals to the bus or other point of termination.

4. If contact between cable and an adjacent bus cannot be avoided, as may be the case with the two 500-MCM cables per phase, tape the bus in the immediate vicinity of the cable contact point so that the surface creepage distance from the cable to the bare bus bar is at least three inches. Thus, the surface creepage from the bare bus, where the cable terminates, to the bare part of the bus, where the cable touches, will be at least seven inches. The thickness of tape on the bus should be approximately 10/64 inch. General Electric No. 8380 tape is recommended for most of the buildup, and Scotch* Brand No. 33 tape over-all.

5. Where more than two 500-MCM cables per phase are required, they should be brought into different sections, or an incoming line compartment must be provided.

* Reg. Trade-mark of Minnesota Mining and Manufacturing Company.

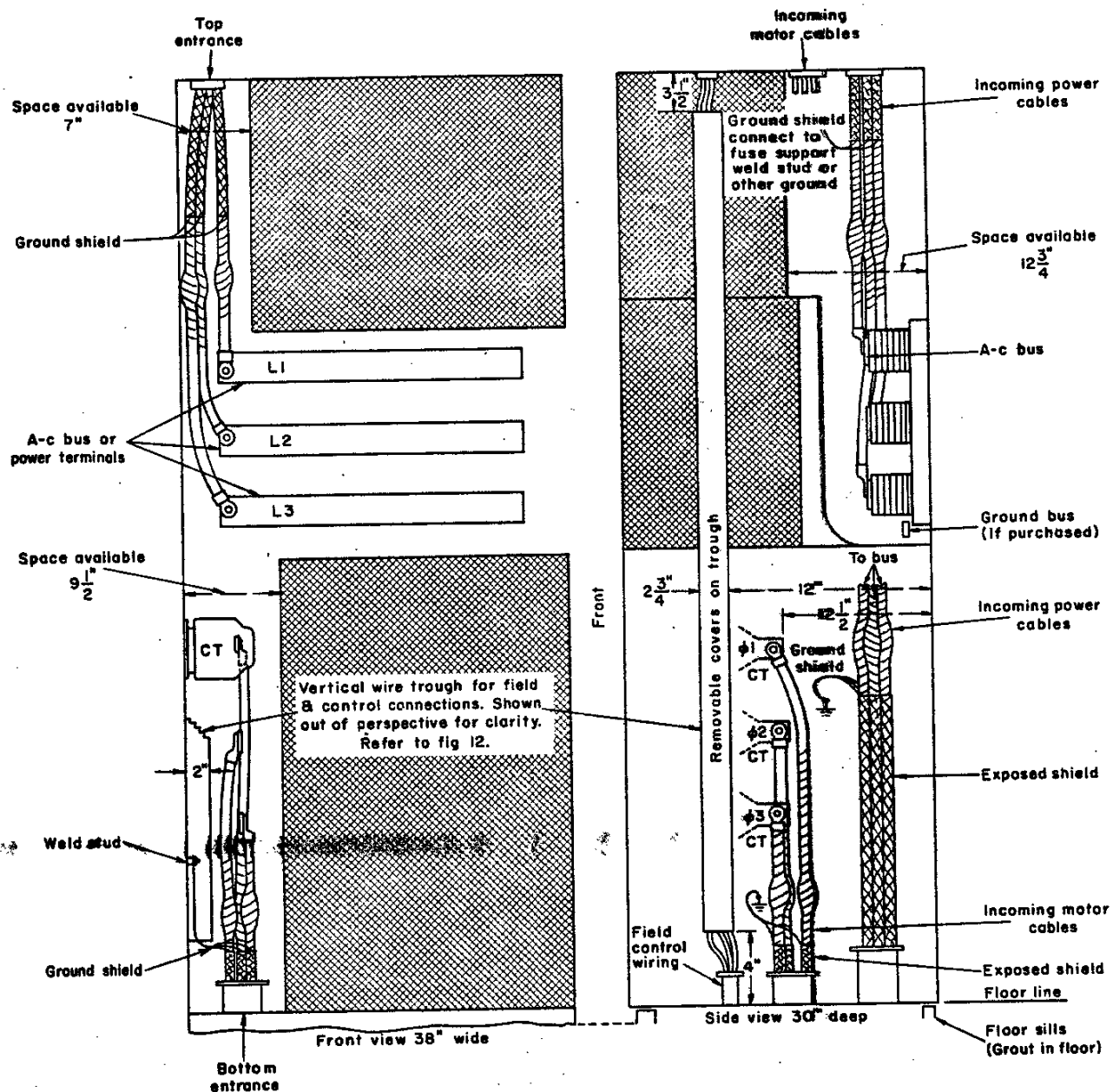


Fig. 19. Recommended location of incoming power and motor cables and field and control wiring in a standard Limitamp unit. Power cabling shown is shielded cable. Cross-hatched areas are occupied and allow no room for cable entrance. Refer to the outline diagram of each controller for details

6. Run all the low-voltage wires through the panel's grounded wire trough so as to avoid any possible contact with high-voltage lines.

TERMINATION OF LEAD-COVERED CABLE

Termination of lead-covered cable requires the use of potheads (see Fig. 20). The pothead manufacturer's instructions should be followed in termi-

nating the cable at the pothead. Standard Limitamp starters have space for locating one pothead of the pull-through type which accommodates up to and including 2/0, three-conductor, 5,000-volt cable. In this type of pothead the three conductors of the cable are fanned out within the pothead and pass completely through it with the pothead sealing and terminating the lead covering. For larger cables, potheads with terminating bushings are required. In this case, or when more than one pull-through type

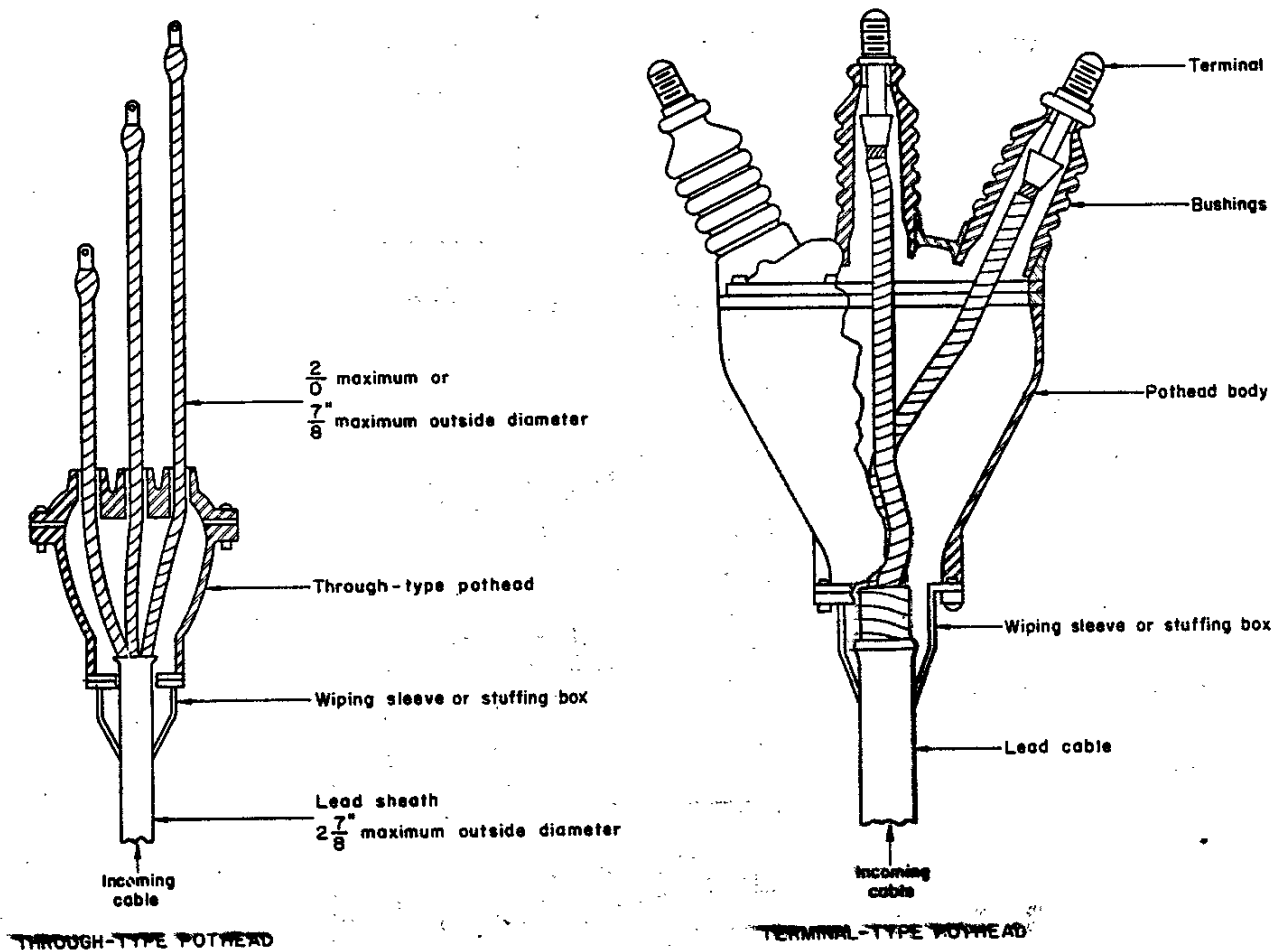


Fig. 20. Termination of cable in potheads

is required, special cable entrance compartments are available to provide adequate working room to prepare the pothead cable terminations.

Through-type potheads are satisfactory for varnished cambric cable indoors. Paper cables are more hygroscopic and since the only thing protecting the individual conductors from moisture is tape on the surface, high humidity might cause difficulty. Terminal-type potheads would not present this possibility.

POTHEAD-CABLE TERMINATIONS

The instructions for terminating lead-covered cable by using potheads apply as well to those terminations of other types of cable where potheads may be desired.

TERMINATION OF NON-SHIELDED, NON-LEAD-COVERED CABLE

This cable is generally run through rigid conduit or cable raceways and brought into the enclosure by use of conventional cable clamps and conduit fittings. Refer to Fig. 21 and 22 for terminating details.

TERMINATION OF INTERLOCKED-ARMOR CABLE

Interlocked-armor cable is terminated by means of specially designed cable fittings. These terminators consist generally of mounting bracket, armor clamp, supporting base and bushing, with various modifications available for special types of sealing.

Interlocked-Armor, Non-Shielded Cable:

RUBBER COVERED - Refer to Fig. 23 for general information concerning termination. For de-

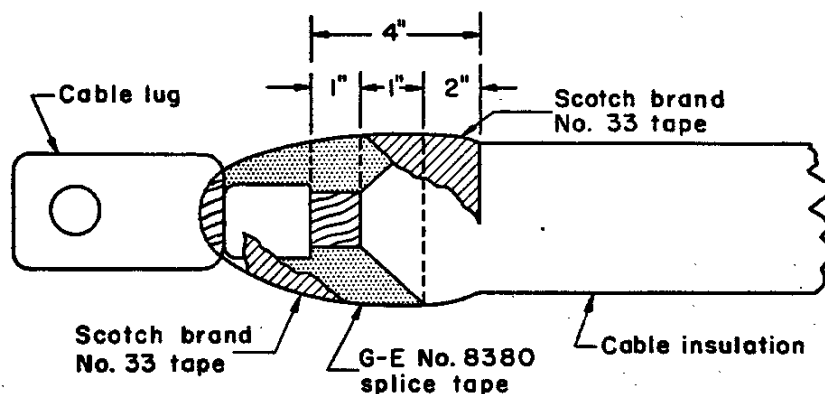


Fig. 21. Termination of rubber-insulated, non-shielded, non-lead-covered, 5000-volt cable

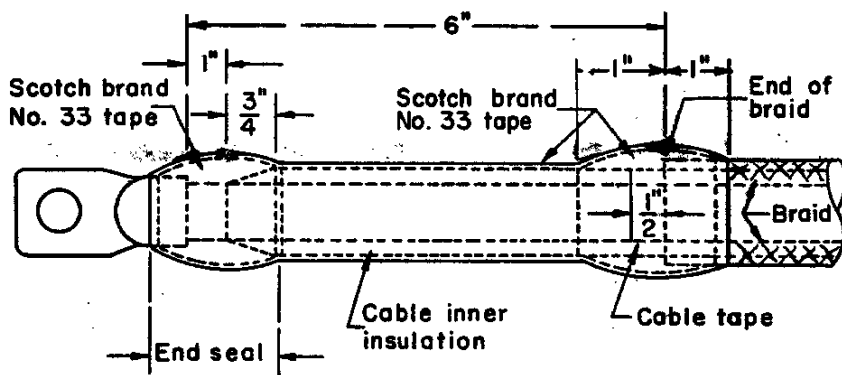
tails, refer to Fig. 21. Note that rubber-covered cable requires only taping near the terminal and not back to the terminator fitting. However, if there is a possibility of oil coming in contact with the rubber insulation, it would be well to use a layer of Scotch Brand No. 33 tape all the way back to the terminator fitting.

VARNISHED CAMBRIC - Refer to Fig. 23 for general information concerning termination. For details, refer to Fig. 22. Note that varnished-

cambric cable requires taping back to the terminator fitting since the individual conductors or "singles" have no braid.

Interlocked-Armor, Shielded Cable:

Interlocked-armor, rubber-covered, and varnished-cambric insulated cables are rarely shielded at ratings of 5 kv and below. If they should be, proceed to terminate as detailed for other types of shielded cables.



1. Cut cable to proper length leaving conductor sufficiently long to extend into the terminal lug.

2. Remove braid, tape, and inner insulation and expose the conductor end for a distance of one inch plus the length of conductor to go into the terminal lug.

3. Attach terminal to conductor.

4. Tape the insulation as shown.

5. Remove the braid and tape, if any, six inches from the lug, exposing the insulation. Leave one-half

inch of original cable tape extending beyond the cut-back braid.

6. Apply the end seal using Scotch Brand No. 33 electrical tape. Obtain a smooth wrapping but do not stretch tape more than necessary.

7. Bind down end of braid and tape, if any, with Scotch Brand tape as shown on drawing.

8. Apply two layers half-lap of Scotch Brand tape over-all from lug to exposed braid.

Fig. 22. Termination of varnished-cambric-insulated, non-shielded, non-lead-covered, 5000-volt cable

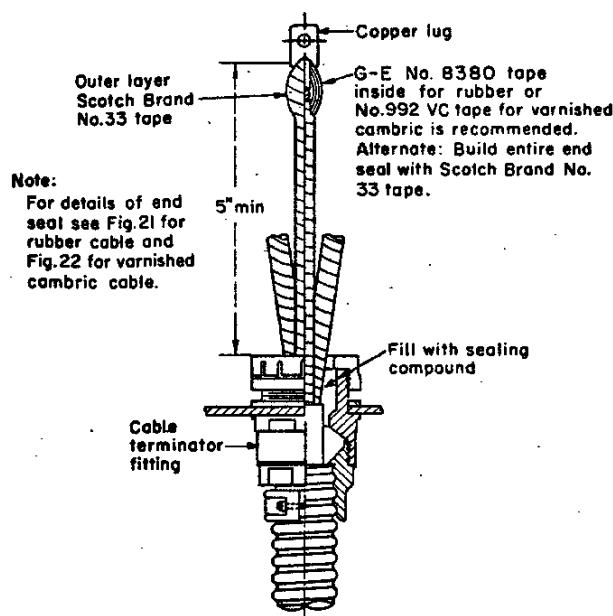


Fig. 23. Termination of interlocked-armor, non-shielded, 5000-volt cable

TERMINATION OF SHIELDED CABLE

It is recommended that when shielded cable is used, "stress relief cones" be built up at the cable terminations. This will relieve the electrical stress which occurs in the area around the termination of the ground shield. Whenever possible, the conduit should be brought in through the bottom. With bottom entrance, a maximum of two 500-MCM cables per phase may be terminated in one full-voltage starter section. Only one 500-MCM cable per phase may be terminated in one full-voltage section, however, when the entrance is from the top. When making shielded cable terminations to Limitamp, the following procedure is recommended:

1. At a point at least 10 inches from the nearest bus-bar or other terminal point, but as close as possible to the conduit, mark each cable.
2. Remove all shielding from the terminal end to this point, leaving sufficient ground strip to reach the nearest ground connection.
3. Proceed to build stress cones as prescribed by the cable manufacturer. Refer to Fig. 24 and 25 for details.
4. Tie all the ground strips together and fasten them to a ground connection.

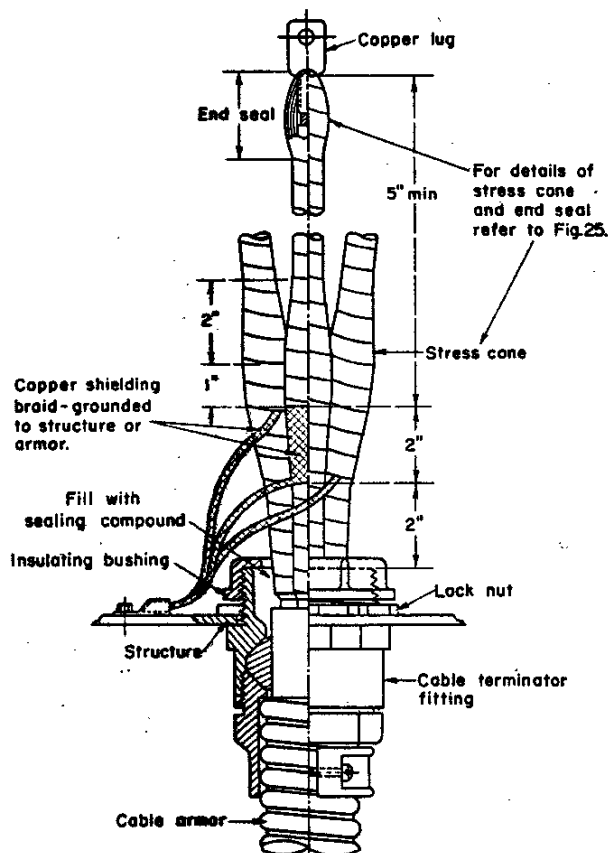


Fig. 24. Termination of interlocked-armor, shielded, 5000-volt cable

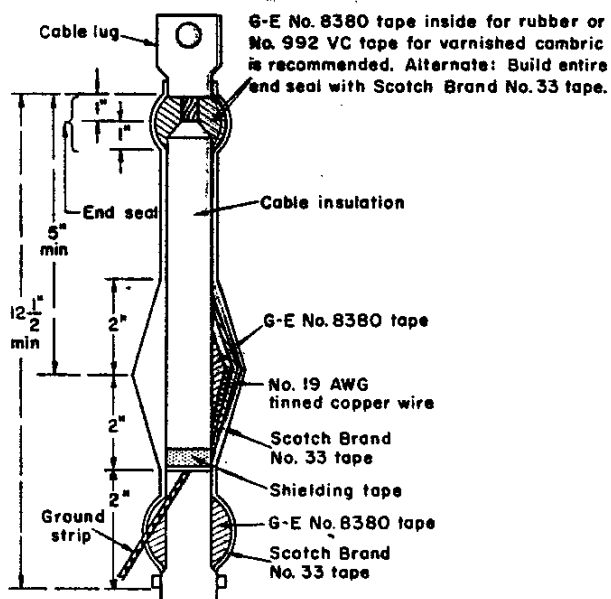


Fig. 25. Termination of shielded, 5000-volt cable, showing stress cone construction

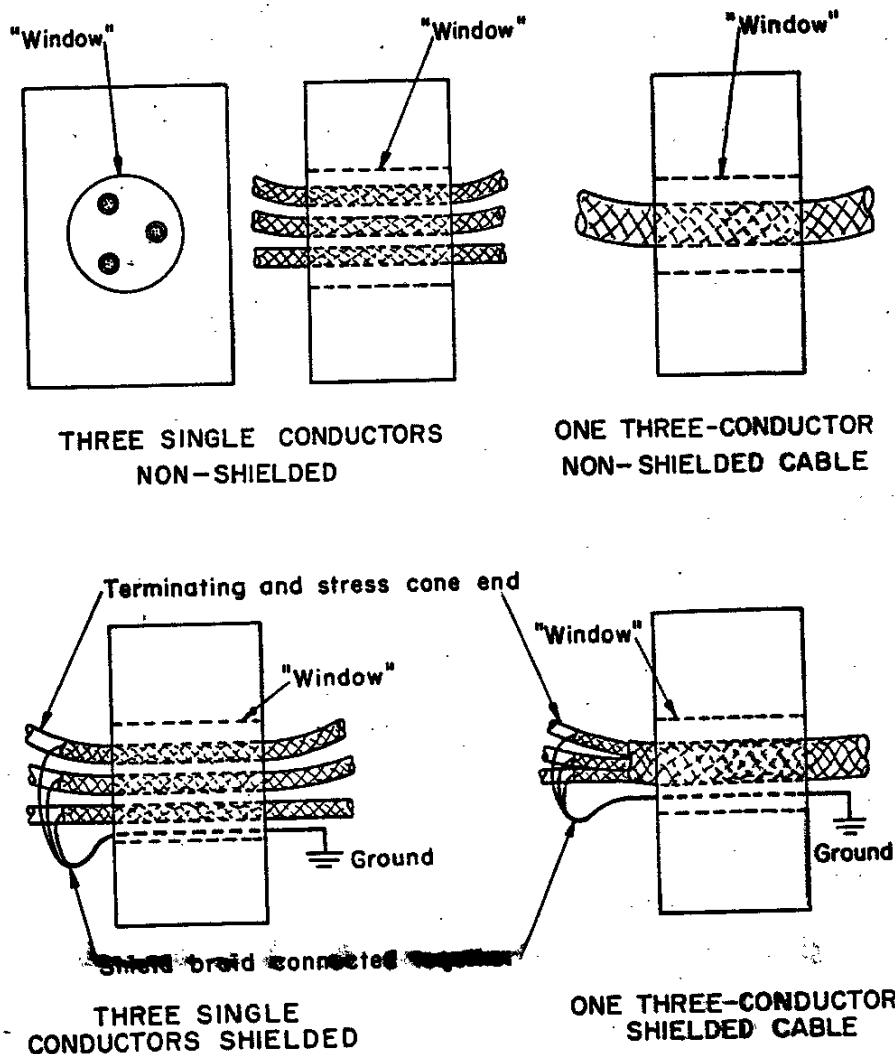


Fig. 26. Installation of cable through window-type current transformers

If the above recommendations, along with the cable manufacturer's recommendations, are followed, the cable terminations should be satisfactory and reliable. These instructions apply to both rubber-covered and varnished-cambric insulated shielded cables.

TERMINATION OF CABLE THROUGH WINDOW-TYPE CURRENT TRANSFORMERS

Window- or "doughnut"-type current transformers are frequently used for metering purposes. In some instances, a window-type current transformer is installed to give instantaneous ground fault protection. The following precautions are to be ob-

served when using such current transformers (refer to Fig. 26).

1. Cables of all three phases should be passed through the current transformer window.

2. If shielded cable is used, all three shielded conductors are passed through the current transformer. The requirements of proper shielding and ground relaying are met by connecting the three shielding tapes together at the point where the stress cone termination is made; but then DO NOT ground the tapes at that point. Grounding of the shielding tape must be accomplished by a braided copper tape connected to the common point of the cable shielding

tapes, and then passed back through the current transformer window and grounded at some convenient location.

3. If lead cable is used and carried through the window, it should be grounded by a braid passed through the current transformer window in the reverse direction.

4. If the current transformer comes with the control panel and has cables already installed, and if it should become necessary to remove the cable for any reason, such as rolling out the contactors, the cables should be replaced exactly as originally installed.

PREPARATION OF PANEL FOR OPERATION

Once the panel is in place and the cable terminated, clean the inside with a brush, soft cloth, or dry compressed air. Make certain that any dirt, dust or bits of packing material, which may interfere with successful operation of the panel devices, are removed from the panel. Care should be taken during the cleaning operation to prevent any dirt from being blown into the inaccessible spaces of the devices.

Before the panel can be operated, even for a try-out without power, all devices must be placed in full operating condition. The armatures of many of the relays and contactors, including the high-voltage contactors, have been tied or blocked to prevent ~~operation during shipment. All of the ties and blocks~~

should be removed. Also check to insure that no tools or loose wires have been left within the panel during installation.

The seating surfaces of unplated and laminated a-c contactor and relay magnets, as well as the end of shafts, are coated with a heavy grease rust preventative. Before operating the panel, the rust preventative should be wiped off and the magnet seating surfaces coated with a thin film of light machine oil.

Operate each device by hand to see that the moving parts operate freely and without binding. Make sure that all electrical contact tips are clean, free of grease and dirt, and make a good contact when closed. The relay and contactors are carefully adjusted at the factory, but should an adjustment of these devices be necessary, these adjustments are explained in the individual instructions for each device.

After all connections have been properly made, all parts properly assembled, and all components thoroughly inspected and adjusted, power may be applied to the panel.

RENEWAL PARTS

When ordering renewal parts, address the nearest General Electric Company apparatus sales office, specify the quantity required, and give the catalog number or describe the required parts in detail. Give the complete nameplate rating of the equipment.